SHINE Solar and Heliospheric Model Validation Project

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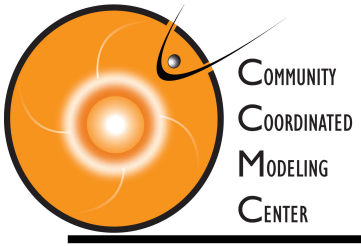
CCMC Workshop
Annapolis, April 3, 2014



Workshop Comments
'Validation Validation'

- Chenette – Scientific validation is a critical component of the CCMC mission.
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- Sojka – Validation feedback does not get back to the developers in an effective way.
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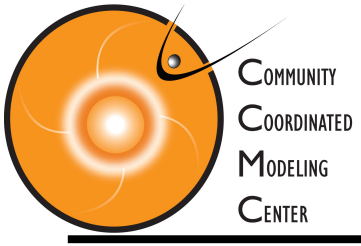
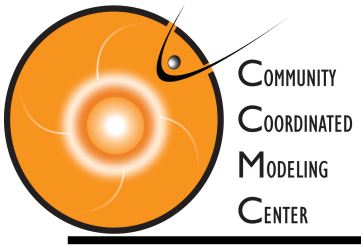


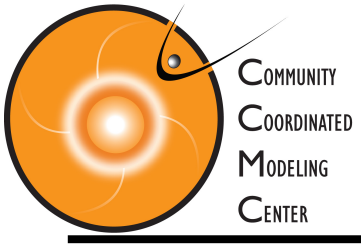
Goals

- Validation for Operations is labor intensive
  - Metrics are relatively few, relatively easy to define and relatively unchanging
- **Validation for science use** is potentially Very labor intensive
  - Range of Metric choices is much larger
  - Defining best metric for a particular process or physical feature is a research question and a significant part of the whole effort
  - Science community's metric focus is a moving target
  - Community is small and manpower available for this is very limited!
- Can we automate the process?
  - Can we configure the process so it can tap the model developer's natural development cycle?
- How can we make the process responsive to the needs of the research community?



Solution

- Develop a web based system to automate
  - submission of model results by developers
  - generation of validation-relevant graphics that enables competing models to be compared directly
    - Comparable models produce exact same diagnostics with exact same graphical design for ease of comparison
  - review and ‘certification for release’ of graphics by model developers
  - automated dissemination of ‘developer certified’ diagnostics
  - submission of new graphics coding to enable validation process to expand its scope



SHINE Discussions and Planning

- Initial proposal presented at SHINE 2011
  - Acquired community buy-in
    - Not a model shootout !!!!!
    - All about presenting validation data to community, not declaring winners and losers !
  - Discussed needs
  - Outlined basic web based approach to be implemented at CCMC
  - Chose initial test cases and diagnostics
    - ambient corona and inner heliosphere for CRs 2058 and 2062.
- SHINE 2012
  - Reported on initial data submissions
  - Established web site requirements and initial trial implementation
- July 2012 to Present
  - Built and tested core web site functionality
  - System officially turned on just before fall AGU 2013

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Submission Process

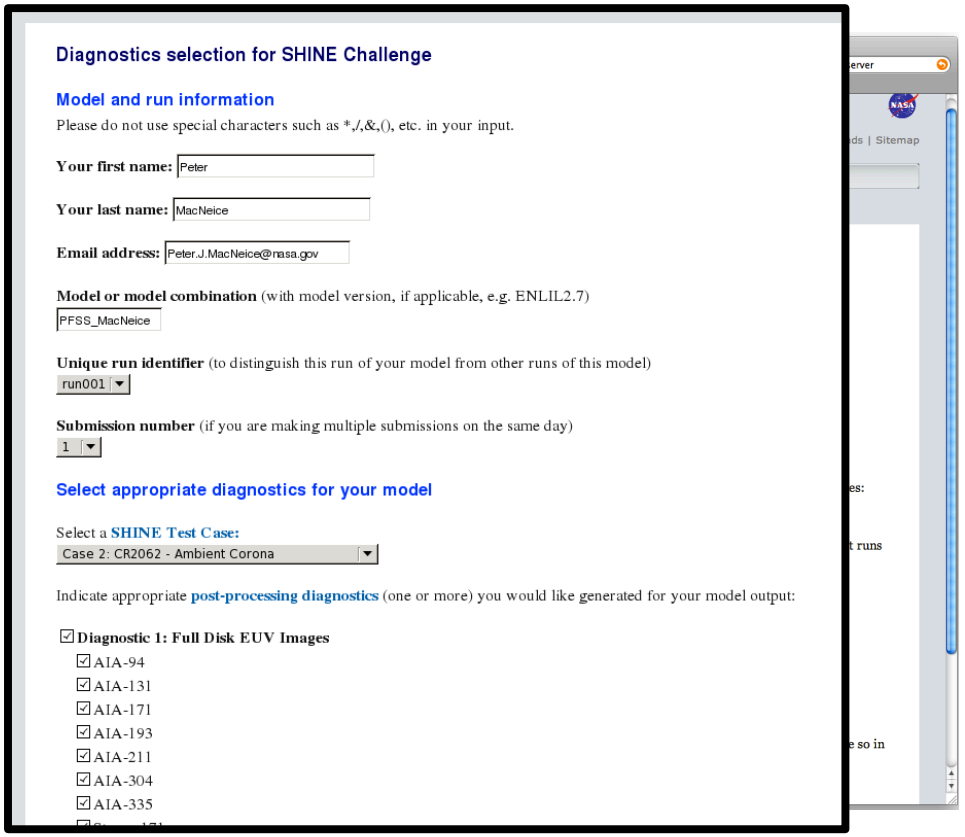
Step 1 : Register run, describe data format and identify suitable diagnostics

Step 2 : CCMC acknowledges registration and returns submission instructions

Step 3 : Submit your results file and a description text file to the CCMC anonymous ftp server

CCMC ftp Server

CCMC Web Server



Diagnostics selection for SHINE Challenge

Model and run information

Please do not use special characters such as *,/,&,(), etc. in your input.

Your first name: Peter

Your last name: MacNeice

Email address: Peter.J.MacNeice@nasa.gov

Model or model combination (with model version, if applicable, e.g. ENLIL2.7)

PFSS_MacNeice

Unique run identifier (to distinguish this run of your model from other runs of this model)

run001

Submission number (if you are making multiple submissions on the same day)

1

Select appropriate diagnostics for your model

Select a **SHINE Test Case:**

Case 2: CR2062 - Ambient Corona

Indicate appropriate **post-processing diagnostics** (one or more) you would like generated for your model output:

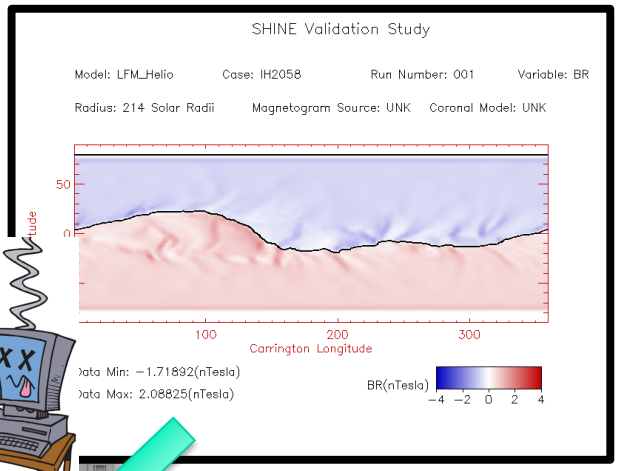
☑ **Diagnostic 1: Full Disk EUV Images**

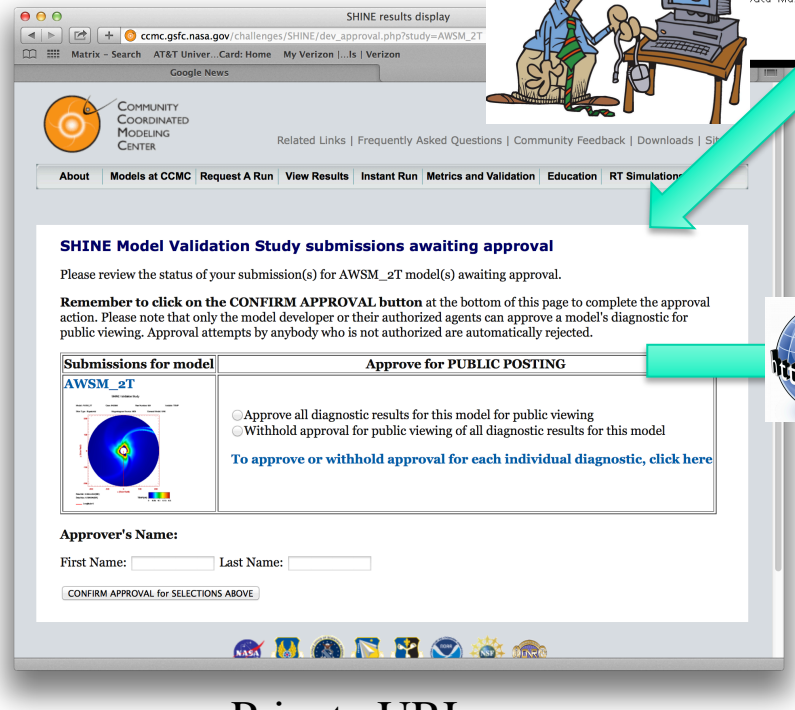
- ☑ AIA-94
- ☑ AIA-131
- ☑ AIA-171
- ☑ AIA-193
- ☑ AIA-211
- ☑ AIA-304
- ☑ AIA-335

Processing and Review

Step 4 : CCMC system generates relevant validation graphics for this model and posts on private web page for model developer

CCMC auto Processing





Private URL

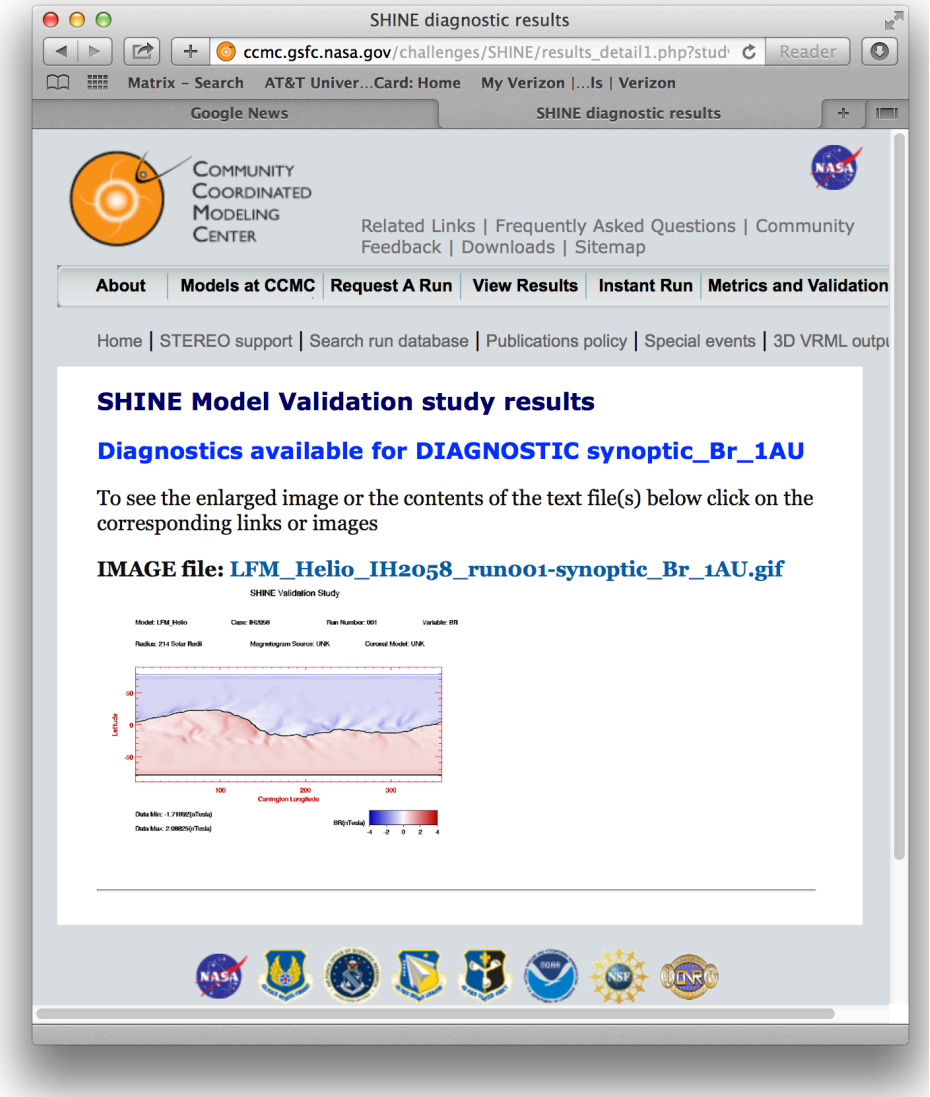
CCMC Web Server

Step 5 : Model developer reviews their model's graphics and approves or denies for public viewing.

Public Dissemination

Step 6 : Approved graphics are pushed to publicly viewable web pages.

CCMC Web Server



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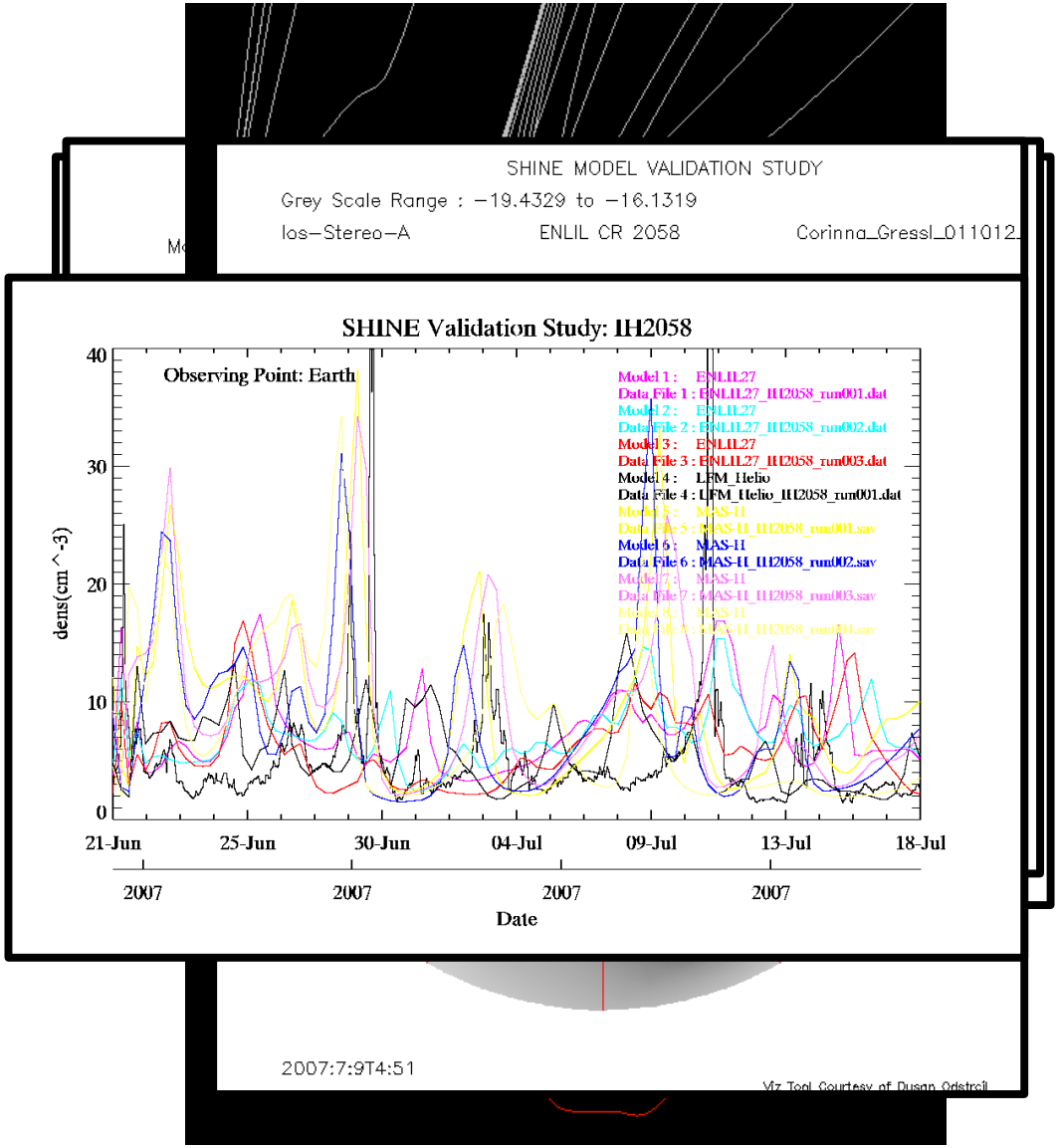
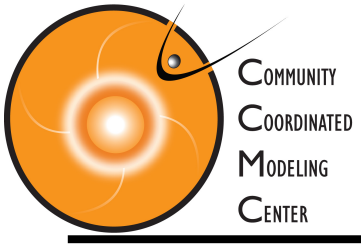
Diagnostics Implemented

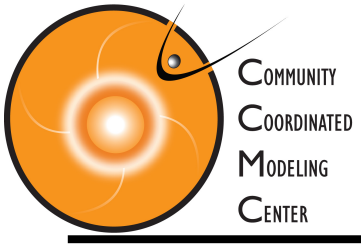
- Planar cuts
  - Synoptic Plots at variable solar distances
  - Equatorial cuts
  - Longitudinal cuts
- Generalized Timelines
  - Planet and spacecraft trajectories
  - Line cuts
  - Comparative
- Synthetic EUV Images (contrib. by Sarah Gibson)
- Synthetic Heliograph Images (contrib. by D.Odstrcil)
- Support for fieldline plotting with SWx2





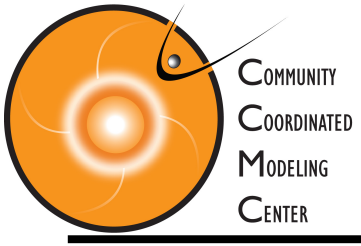
Models Participating

- ENLIL (Odstrcil) – 3D MHD Inner Heliosphere, V2.7 and V2.8a
- HelTomo (Jackson et al) – 3D Heliospheric Tomography
- YMNP (Yeates, MacKay) – Coronal Non-Linear Force Free Model
- LFM-Helio (Merkin,Pahud) – 3D MHD Inner Heliosphere
- WSA (Arge) – Pseudo-potential corona + kinematic wind
- CORHEL (Riley at al) - MHD Corona and Inner Heliosphere
- AWSM_2T (Oran, Sokolov et al) – 3D MHD, 2 temperature
- NLFFF (Asfaw, Weigelmann) – Coronal Non-Linear Force Free Model
- PFSS (MacNeice) – 3D Potential coronal field model



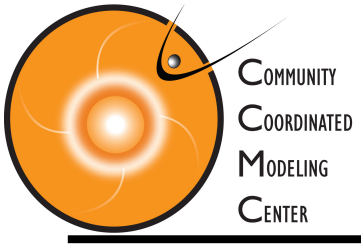
Current Status

- Baseline system has been on-line since Dec 6, 2013
- Have 9 models participating
- More than 600 diagnostics currently generated (most pending review)



SHINE 2014 and Future Development

- Review current system design
- Add test cases for solar maximum
- Discuss impact of time evolving magnetograms on model validation strategies
- Continue design of diagnostic processing for models with adaptively refined grids



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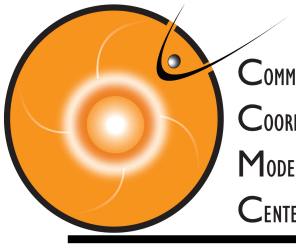

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